

CLAIMS

1. In a grinder assembly for grinding a food ingredient and having a frame, a protective housing mounted to the frame with a top, a grinding chamber containing at least one powered grinding member mounted to the frame within the housing, the improvement being a removable hopper assembly, comprising:

a removable ingredient hopper body for holding ingredient to be ground, said ingredient hopper body having an open top for receipt of ingredient to be ground, a bottom with a hopper outlet opening and means for releasably mounting the hopper body within the housing at an operative position in which ingredient may be passed from the hopper body to the grinding chamber;

a hopper closure assembly attached to the hopper and including
a closure member mounted for movement between an open position and
a closed position, and
means attached to the hopper body for automatically moving the closure member to the closed position in which the hopper outlet opening is closed by the closure member; and

an electromechanical device permanently mounted within the housing for selectively moving the closure member to the open position when the hopper is releasably mounted at the operative position, engagement of the device with the closure member being non-interfering with manual, tool-less removal of the hopper body by simple manual lifting of the hopper upwardly away from the operative position and out of the top of the housing.

2. The grinding assembly of claim 2 in which the closure member is mounted for laterally sliding movement between the open position and the closed position and the electromechanical device has a pusher member that selectively pushes the closure member laterally to the open position and the pusher member is laterally spaced from and out of engagement when in a closed position.
3. The grinding assembly of claim 2 in which the electromechanical device is a linear solenoid with a body member and the pusher member is moved away from the solenoid body when the solenoid is energized to engage and push the closure member to the open position.
4. The grinding assembly of claim 2 in which the automatic closure member moving means is a spring.
5. The grinding assembly of claim 1 in which the closure member is mounted for laterally sliding movement between the open position and the closed position and the electromechanical device has a puller member that selectively pulls the closure member laterally to the open position.
6. The grinding assembly of claim 5 in which a releasable connector is mounted to the puller member connector and the closure member is permanently connected to another mating connector for mating releasable engagement with the releasable connector.

7. The grinding assembly of claim 6 in which the one of the releasable connector and the other mating connector is a male member and the other of the one connector and the other connector is a mating female member.
8. The grinding assembly of claim 7 which the female member has an opening that faces in a vertical direction and the male member is received within the opening when the hopper body is lowered through the top into the operative position and is slideably separated from within the opening when the hopper body is lifted vertically out of the housing top and separated from the housing.
9. The grinding assembly of claim 8 in which the male member has an inwardly tapered distal end to guide and facilitate insertion of the male member into the opening.
10. The grinding assembly of claim 7 in which the male member has an inwardly tapered distal end to guide and facilitate insertion of the male member into the opening.
11. The grinding assembly of claim 8 in which the male member is mounted to the distal end of the pusher member and extends upwardly and the female member is attached to the closure member with the opening of the female member facing downwardly.
12. The grinding assembly of claim 8 in which the male member is mounted to the closure member and extends downwardly and the female member is attached to the distal end of the pusher member with the opening facing upwardly.

13. The grinding assembly of claim 5 in which one of the releasable connector and the other mating connector includes a permanent magnet.
14. The grinding assembly of claim 13 in which the other of the releasable connector and the other mating connector includes one of (a) another permanent magnet, and (b) a ferromagnetic member.
15. The grinding assembly of claim 14 in which the permanent magnet and the one of the other permanent magnet and the ferromagnetic member magnetically adhere to each other when the hopper body is lowered to the operative position.
16. The grinding assembly of claim 5 in which one of the releasable connector and the other mating connector includes a fastener hook array member and the other of the releasable connector and the other mating connector includes a fastener loop array member for mating releasable connection with the fastener hook array member when the hopper body is lowered to the operative position.
17. The grinder assembly of claim 1 in which the means for releasable mounting the hopper includes
- at least one hopper mounting member extending laterally outwardly from at least one of the opposite sides of the hopper, and
- at least one hopper mounting support member attached

to the frame and providing underlying hanging support for the at least one hopper mounting member.

18. A food ingredient hopper assembly adapted for use with a food grinder assembly having a protective housing, comprising:

a manually portable, removable, hopper body for containing a supply of ingredient to be ground by a mating grinding assembly having a housing within which the body is adapted for releasable mounted engagement in an operative location protectively contained within a housing;

means carried by the removable hopper body for releasable mounted relationship with the hopper body at an operative location within the housing at which ingredient may be selectively passed to a grinding chamber of the grinder assembly;

a hopper outlet opening at the bottom of the hopper; and

a hopper outlet closure assembly mounted to the hopper body adjacent to the hopper outlet opening and having a closure member with attached means for engagement by electromechanical means to enable movement of the closure member to an open position by automatic opening apparatus protectively contained within the housing when the hopper body is located in the operative position.

19. The food ingredient hopper assembly of claim 18 including a mounting member attached adjacent to the top of the hopper body and extending outwardly from the side of the body for underlying supportive hanging engagement with a mating, hopper mounting member of the food grinder assembly with which it is adapted for use.

20. The grinding assembly of claim 18 in which the engagement means includes a generally vertical engagement wall connected to the closure member that is positioned for engagement by a pusher member of the electromechanical to push the closure member to the open position, said pusher member being laterally spaced from, and out of engagement with the engagement member when the closure member is in a closed position.
21. The grinding assembly of claim 20 in which the electromechanical device is a linear solenoid with a body member and the pusher member is moved away from the solenoid body when the solenoid is energized to engage and push the engagement wall to slide the closure member to the open position.
22. The grinding assembly of claim 18 including an automatic closure means that automatically moves the closure member to a closed position when not being moved to an open position by the electromechanical means.
23. The grinding assembly of claim 22 in which the automatic closure means includes at least one of (a) a spring and (b) a permanent magnet.
24. The grinding assembly of claim 18 in which the closure member is mounted for laterally sliding movement between the open position and the closed position and the

electromechanical means has a puller member that selectively pulls the closure member laterally to the open position.

25. The grinding assembly of claim 24 in which a releasable connector is mounted to the puller member connector and the closure member is permanently connected to another mating connector for mating releasable engagement with the releasable connector.

26. The grinding assembly of claim 25 in which the one of the releasable connector and the other mating connector is a male member and the other of the one connector and the other connector is a mating female member.

27. The grinding assembly of claim 26 which the female member has an opening that faces in a vertical direction and the male member is received within the opening when the hopper body is lowered through the top into the operative position and is slideably separated from within the opening when the hopper body is lifted vertically out of the housing top and separated from the housing.

28. The grinding assembly of claim 27 in which the male member has an inwardly tapered distal end to guide and facilitate insertion of the male member into the opening.

29. The grinding assembly of claim 26 in which the male member has an inwardly tapered distal end to guide and facilitate insertion of the male member into the opening.

30. The grinding assembly of claim 27 in which the male member is mounted to the distal end of the pusher member and extends upwardly and the female member is attached to the closure member with the opening of the female member facing downwardly.
31. The grinding assembly of claim 27 in which the male member is mounted to the closure member and extends downwardly and the female member is attached to the distal end of the pusher member with the opening facing upwardly.
32. The grinding assembly of claim 24 in which one of the releasable connector and the other mating connector includes a permanent magnet.
33. The grinding assembly of claim 32 in which the other of the releasable connector and the other mating connector includes one of (a) another permanent magnet, and (b) a ferromagnetic member.
34. The grinding assembly of claim 33 in which the permanent magnet and the one of the other permanent magnet and the ferromagnetic member magnetically adhere to each other when the hopper body is lowered to the operative position.
35. The grinding assembly of claim 24 in which one of the releasable connector and the other mating connector includes a fastener hook array member and the other of the releasable connector and the other mating connector includes a fastener loop array

member for mating releasable connection with the fastener hook array member when the hopper body is lowered to the operative position.

36. The grinder assembly of claim 18 in which the means for releasable mounting the hopper includes

at least one hopper mounting member extending laterally outwardly from at least one of the opposite sides of the hopper, and

at least one hopper mounting support member attached to the frame and providing underlying hanging support for the at least one hopper mounting member.

37. For use in an electric food ingredient grinder having a housing within which are located an ingredient hopper body with a hopper outlet opening for passing ingredient to a grinding chamber, a method for tool-less mounting and removal of the ingredient hopper comprising the steps of:

removably mounting the ingredient hopper within the housing at an operative position in which a closure member carried by the ingredient hopper body is movable to an open position by an electromechanical means contained within the housing;

automatically moving the closure member to a closed position by means carried by the ingredient hopper when unopposed by the electromechanical means;

selectively energizing the electromechanical means for selectively moving the closure member to the closed position in opposition to the automatically moving means to pass ingredient from the hopper to the grinding chamber;

removing the ingredient hopper body from within the housing by simply manually lifting the hopper body upwardly out of the top of the housing.

38. The method of claim 37 including the step of placing de-energizing the electromechanical means prior to removing the ingredient hopper body from the within the housing to enable automatic movement of the closure member to the closed position prior to removal.

39. The method of claim 37 in which the step of selectively moving the closure member to the closed position is performed by pushing the closure member to the closed position with a pusher member when the electromechanical means is energized.

40. The method of claim 39 including the step of moving the pusher member to a lateral position in which the electromechanical means is de-energized that is spaced from a vertical path taken by the hopper body when being installed or removed through the top of the housing to prevent any interference by the pusher member with such installing and removal of the hopper body.

41. The method of claim 37 in which the step of selectively moving the closure member to the closed position is performed by pulling the closure member through a releasable connection with the electromagnetic means to the to the closed position a when the electromechanical means is energized.

42. The method of claim 37 in which the electromechanical means has a connector and the closure member has another connector and including the step of mating the one connector with the other connector automatically during vertical installation into the open top of the housing and into the operative position

43. The method of claim 42 including the step of separating the one connector and the other connector during vertical removal from of the hopper body from the open top of the housing.

44. The method of claim 37 in which the step of mating the connectors includes the step of receiving in a vertical direction, a male connector in a vertical direction and carried by one of the hopper and the electromechanical means within an opening of a mating female connector carried by the other of the hopper body and the electromechanical means automatically during installation of the hopper body by lowering the hopper through the housing top into the operating position.

45. The method of claim 44 in which the step of separating the connectors includes the step of separating in a vertical direction, a male connector in a vertical direction and carried by one of the hopper and the electromechanical means from within an opening of a mating female connector carried by the other of the hopper body and the electromechanical means automatically during removal of the hopper body by lifting the hopper through the housing top and out of the operating position.

46. The method of claim 37 in which at least one of the connectors is a permanent magnet and another one of the connectors is either a permanent magnet or a ferromagnetic material, and including the steps of

interconnecting the two connectors automatically during installation of the hopper into the operative position to hold by magnetic attractive force against lateral separation during pulling of the closure member to the closed position, and

separating the two connectors automatically during removal of the hopper from the operative position by pulling them apart in a vertical direction in opposition to the magnetic attractive force.

47. The method of claim 37 in which the at least one of the connectors is an array of resilient hook-like members and the other one of the connectors includes an array of hook-like members and including the steps of

interconnecting the two connectors automatically during installation of the hopper into the operative position to hold them against lateral separation during pulling of the closure member to the closed position, and

separating the two connectors automatically during removal of the hopper from the operative position by pulling them apart in a vertical direction.

48. In a grinder assembly for grinding a food ingredient and having a frame, a protective housing mounted to the frame with a top, a grinding chamber containing at least one powered grinding member mounted to the frame within the housing, the improvement being a removable hopper assembly, comprising:

a removable ingredient hopper body for holding ingredient to be ground, said ingredient hopper body having an open top for receipt of ingredient to be ground, a bottom with a hopper outlet opening and means for releasably mounting the hopper body within the housing at an operative position in which ingredient may be passed from the hopper body to the grinding chamber;

a hopper closure assembly attached to the hopper and including

a closure member mounted for movement between an open position and a closed position, and

means attached to the hopper body for automatically moving the closure member to the closed position in which the hopper outlet opening is closed by the closure member; and

an electromagnet permanently mounted within the housing for selectively moving the closure member to the open position when the hopper is releasably mounted at the operative position, energizing of the electromagnet creating an electromagnetic force that moves the closure member to the closed position, said electromagnet being spaced from engagement of the device with the closure member being non-interfering with manual, tool-less removal of the hopper body by simple manual lifting of the hopper upwardly away from the operative position and out of the top of the housing.

49. The grinder assembly of claim 48 in which the electromagnetic force attracts the closure member to the open position.

50. The grinder assembly of claim 49 including a ferromagnetic member attached to the closure member and attracted by the magnetic force when the electromagnet is energized.

51. The grinder assembly of claim 50 in which the electromagnetic force repels the closure member to move to the open position.

52. The grinder assembly of claim 51 including a permanent magnet attached to the closure member and is repelled by the electromagnetic force from the electromagnet when energized to move the closure member to the closed position.

53. The grinder assembly of claim 48 in which the automatically closure member includes one of (a) a spring, and (b) a permanent magnet.

54. For use in an electric food ingredient grinder having a housing within which are located an ingredient hopper body with a hopper outlet opening for passing ingredient to a grinding chamber, a method for tool-less mounting and removal of the ingredient hopper comprising the steps of:

removably mounting the ingredient hopper within the housing at an operative position in which a closure member carried by the ingredient hopper body is movable to an open position by magnetic force from an electromagnet protectively contained within the housing;

automatically moving the closure member to a closed position by means carried by the ingredient hopper when unopposed by the electromechanical means;

selectively energizing the electromagnet for selectively moving the closure member to the closed position with magnetic force in opposition to the automatically moving means to pass ingredient from the hopper to the grinding chamber; removing the ingredient hopper body from within the housing by simply manually lifting the hopper body upwardly out of the top of the housing.

55. The method of claim 54 in which the step of selectively moving the closure member to the closed position is performed by at least one of (a) pulling magnetic force and (b) a repulsive magnetic force.

56. In a grinder assembly for grinding a food ingredient and having a frame, a protective housing mounted to the frame with a top, a grinding chamber containing at least one powered grinding member mounted to the frame within the housing, the improvement being a removable hopper assembly, comprising:

a removable ingredient hopper body for holding ingredient to be ground, said ingredient hopper body having an open top for receipt of ingredient to be ground, a bottom with a hopper outlet opening and means for releasably mounting the hopper body within the housing at an operative position in which ingredient may be passed from the hopper body to the grinding chamber;

a hopper closure assembly attached to the hopper and including a closure member mounted for rotary movement between an open position and a closed position, and

means attached to the hopper body for automatically rotating the closure member to the closed position in which the hopper outlet opening is closed by the closure member; and

an electromechanical device permanently mounted within the housing for selectively rotating the closure member to the open position when the hopper is releasibly mounted at the operative position, engagement of the device with the closure member being non-interfering with manual, tool-less removal of the hopper body by simple manual lifting of the hopper upwardly away from the operative position and out of the top of the housing.

57. The grinder assembly of claim 56 in which the electromechanical device is one of (a) a stepper motor, (2) a servo-motor, (3) a DC motor and (4) a rotary solenoid.

58. The grinder assembly of claim 57 in which the automatically rotating means includes a coil spring having one end attached to the hopper body and another end attached to the closure member.

59. The grinder assembly of claim 56 in which the automatically rotating means includes a coil spring having one end attached to the hopper body and another end attached to the closure member.

60. The grinder assembly of claim 56 in which the closure member includes a male connection members that is received within a mating female engagement member

associated with the electromechanical device automatically when the hopper is lowered into the operating position.

61. The grinder assembly of claim 60 in which the male member is one of (a) pushed to the open position by the female member, and (b) pulled to the open position by the female member.

62. In a grinder assembly for grinding a food ingredient and having a frame, a protective housing mounted to the frame with a top, a grinding chamber containing at least one powered grinding member mounted to the frame within the housing, the improvement being a removable hopper assembly, comprising:

a removable ingredient hopper body for holding ingredient to be ground, said ingredient hopper body having an open top for receipt of ingredient to be ground, a bottom with a hopper outlet opening and means for releasably mounting the hopper body within the housing at an operative position in which ingredient may be passed from the hopper body to the grinding chamber, said releasable mounting means providing a non-blocking support for the hopper body in the operative position of the hopper body from the to enable tool-less removal of the hopper body from the operative position solely by manual separation;

a hopper closure assembly attached to the bottom of the hopper body and including

a closure member mounted at the bottom for movement between an open position and a closed position,

means for automatically moving the closure member to the closed position in which the hopper outlet opening is closed by the closure member when the hopper body is removed from the operative position, and

means carried by the closure member for releasable engagement with a mating member within the housing for automatically moving the closure member to the open position when the hopper body is moved to the operative position; and

an electromechanically operated gate interposed between the bottom of the hopper body and the grinding chamber and operating independently of the closure member for selectively passing food ingredient from the automatically opened hopper outlet opening to the grinding chamber.

63. The grinder assembly of claim 62 in which the closure member is contained within the body of the hopper and has guide legs extending from the closure member within the body through the outlet opening for guided sliding movement.

64. The grinder assembly of claim 62 in which engagement of the guide legs by the mating engagement member pushes the guide legs inwardly into the body of the hopper to move the closure member away from the outlet opening to an open position in which ingredient may pass around the closure member to the outlet.

65. The grinder assembly of claim 64 in which the automatically closing means includes the weight of the closure member and the guide legs that causes the closure member to

move toward the outlet to the closed position in which the outlet is blocked by the closure member.

66. The grinder assembly of claim 62 in which the automatically closing means includes the weight of the closure member that causes the closure member to move downwardly toward the outlet to the closed position in which the outlet is blocked by the closure member when not pushed upwardly.

67. The grinder assembly of claim 62 in which the movement of the hopper body into and out of the operative position is one of (a) vertical movement through the top, and (b) sliding horizontal movement though a side of the housing.

68. In a grinder assembly for grinding a food ingredient and having a frame, a protective housing mounted to the frame with a top and a side, a grinding chamber containing at least one powered grinding member mounted to the frame within the housing, the improvement being a removable hopper assembly, comprising:

a removable ingredient hopper body for holding ingredient to be ground, said ingredient hopper body having an open top for receipt of ingredient to be ground, a bottom with a hopper outlet opening and means for releasably mounting the hopper body within the housing at an operative position in which ingredient may be passed from the hopper body to the grinding chamber, said releasable mounting means providing a non-blocking support for the hopper body in the operative position of the hopper body to

enable tool-less lateral sliding removal of the hopper body from the operative position solely by lateral sliding movement through the side of the housing;

a hopper closure assembly attached to the bottom of the hopper body and including

a closure member mounted at the bottom for movement between an open position and a closed position,

means for automatically moving the closure member to the closed position in which the hopper outlet opening is closed by the closure member when the hopper body is removed from the operative position, and

means carried by the closure member for releasable engagement with a mating member within the housing that automatically engages the closure member as it is slid into the operative position to automatically move the closure member to the open position when the hopper body is moved to the operative position; and

an electromechanically operated gate interposed between the bottom of the hopper body and the grinding chamber and operating independently of the closure member for selectively passing food ingredient from the automatically opened hopper outlet opening to the grinding chamber.

69. In a grinder assembly for grinding a food ingredient and having a frame, a protective housing mounted to the frame with a top and a side, a grinding chamber containing at least one powered grinding member mounted to the frame within the housing, the improvement being a removable hopper assembly, comprising:

a laterally removable ingredient hopper body for holding ingredient to be ground, said ingredient hopper body having an open top for receipt of ingredient to be ground, a bottom with a hopper outlet opening and means for releasably mounting the hopper body within the housing at an operative position in which ingredient may be passed from the hopper body to the grinding chamber by sliding the hopper into the operative position through the side of the housing;

a hopper closure assembly attached to the hopper and including
a closure member mounted for movement between an open position and
a closed position, and

means attached to the hopper body for automatically moving the closure member to the closed position in which the hopper outlet opening is closed by the closure member; and

an electromechanical device permanently mounted within the housing for selectively moving the closure member to the open position when the hopper is releasably mounted at the operative position, engagement of the device with the closure member being non-interfering with manual, tool-less removal of the hopper body by simple manual lateral sliding movement of the hopper away from the operative position and through the side of the housing.
